



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of:

Applicants: : Mark C. Schmidt et al.
Serial No. : 10/613,527
Filing Date : July 3, 2003
Title of Invention : AUTOMATICALLY-ACTIVATED HAND-SUPPORTABLE 2-D
BAR CODE SYMBOL READING SYSTEM EMPLOYING A
LINEAR LASER SCANNING PATTERN...
Examiner : n/a
Group Art Unit : 2876
Attorney Docket No. : 108-194USANE0

Honorable Commissioner of Patents
and Trademarks
Washington, DC 20231

INFORMATION DISCLOSURE STATEMENT
UNDER 37 C.F.R. 1.97

Sir:

In order to fulfill Applicants' continuing obligation of candor and good faith as set forth in 37 C.F.R. 1.56, Applicants submit herewith an Information Disclosure Statement prepared in accordance with 37 C.F.R Sections 1.97, 1.98 and 1.99.

The disclosures enclosed herewith are as follows:

U.S. PUBLICATIONS

| <u>NUMBER</u> | <u>FILING DATE</u> | <u>TITLE</u> |
|---------------|--------------------|--|
| 6,182,898 | November 22, 1999 | BAR CODE SCANNER WITH INTUITIVE HEAD AIMING AND COLLIMATED SCAN VOLUME |
| 6,158,662 | April 27, 1998 | TRIGGERED OPTICAL READER |
| 5,945,660 | October 14, 1997 | COMMUNICATION SYSTEM FOR WIRELESS BAR CODE READER |
| 5,828,049 | June 18, 1997 | CODE SYMBOL READING SYSTEM WITH MULTI-PORT DIGITAL SIGNAL DECODER |
| 5,828,048 | June 12, 1997 | COUNTERTOP BAR CODE SYMBOL READING SYSTEM HAVING |

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| | | AUTOMATIC HAND-SUPPORTABLE BAR CODE SYMBOL READING DEVICE AND STAND FOR SUPPORTING PROJECTED SCAN FIELD THEREOF |
| 5,825,012 | May 30, 1996 | HAND-SUPPORTABLE LASER SCANNING BAR CODE SYMBOL READER WITH BAR CODE SYMBOL DETECTION ACTIVATED SYMBOL DECODER |
| 5,808,285 | August 17, 1994 | PORTABLE CODE SYMBOL READING DEVICE WITH ONE-WAY WIRELESS DATA PACKET TRANSMISSION LINK TO BASE UNIT EMPLOYING CONDITION-DEPENDENT ACOUSTICAL SIGNALLING FOR DATA PACKET RECEPTION ACKNOWLEDGEMENT |
| 5,786,582 | December 8, 1995 | OPTICAL SCANNER FOR READING AND DECODING ONE- AND TWO DIMENSIONAL SYMBOLOGIES AT VARIABLE DEPTHS OF FIELD |
| 5,796,091 | May 13, 1996 | AUTOMATIC HAND-SUPPORTABLE OMNIDIRECTIONAL LASER PROJECTION SCANNER WITH HANDLE- CONTROLLABLE PROJECTION AXIS |
| 5,789,731 | April 24, 1997 | LASER CODE SYMBOL SCANNER EMPLOYING OPTICAL FILTERING SYSTEM HAVING NARROW PASS- BAND CHARACTERISTICS AND SPATIALLY-SEPARATED OPTICAL FILTER ELEMENTS WITH LASER LIGHT COLLECTION OPTICS ARRANGED ALONG LASER LIGHT RETURN PATH DISPOSED THEREBETWEEN |
| 5,789,730 | June 14, 1996 | AUTOMATIC HAND-SUPPORTABLE LASER SCANNER AND METHOD OF READING BAR CODE SYMBOLS USING SAME |
| 5,777,315 | August 21, 1996 | METHOD AND APPARATUS FOR PROGRAMMING SYSTEM FUNCTION PARAMETERS IN PROGRAMMABLE |

CODE SYMBOL READERS

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| 5,767,501 | May 13, 1996 | MASS-BALANCED AUTOMATIC HAND-SUPPORTABLE LASER PROJECTION SCANNER FOR FATIGUE-FREE OMNIDIRECTIONAL SCANNING OF BAR CODE SYMBOLS |
| 5,756,982 | April 16, 1996 | BODY-WEARABLE AUTOMATIC LASER SCANNER WITH POWER-CONSERVING CONTROL SUBSYSTEM |
| 5,742,043 | May 22, 1996 | BODY-WEARABLE LASER SCANNING SYSTEM WITH PROGRAMMED MODE FOR CONSECUTIVELY READING BAR CODE SYMBOLS WITHOUT SYSTEM REACTIVATION |
| 5,610,386 | July 17, 1995 | PORTABLE OPTICAL SCANNING SYSTEM INCLUDING RING HAVING BREAKAWAY ELEMENT |
| Des. 385,265 | March 12, 1996 | HAND-SUPPORTABLE LASER SCANNER |
| 5,736,982 | August 1, 1995 | VIRTUAL SPACE APPARATUS WITH AVATARS AND SPEECH |
| 5,661,292 | November 20, 1995 | AUTOMATIC LASER PROJECTION SCANNER WITH IMPROVED LASER BEAM SCANNING EFFICIENCY |
| 5,637,852 | June 7, 1995 | COUNTER-TOP PROJECTION LASER SCANNER FOR OMNI-DIRECTIONAL SCANNING OF CODE SYMBOLS WITHIN A NARROWLY CONFINED SCANNING VOLUME, WHILE PREVENTING UNINTENTIONAL SCANNING OF CODE SYMBOLS OF NEARBY OBJECTS |
| 5,627,359 | May 11, 1995 | LASER CODE SYMBOL SCANNER EMPLOYING OPTICAL FILTERING SYSTEM HAVING NARROW BAND-PASS CHARACTERISTICS AND SPATIALLY SEPARATED OPTICAL FILTER ELEMENTS WITH LASER LIGHT COLLECTION OPTICS ARRANGED ALONG LASER LIGHT RETURN PATH |

DISPOSED THEREBETWEEN

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| 5,616,908 | January 11, 1996 | AUTOMATIC COUNTERTOP LASER SCANNER WITH FLICKERING LASER SCANNER BEAM FOR IMPROVED VISIBILITY THEREOF DURING BAR CODE SYMBOL READING |
| 5,600,121 | August 20, 1995 | OFFICIAL READER WITH INDEPENDENT TRIGGERING AND GRAPHICAL USER INTERFACE |
| 5,591,953 | June 7, 1995 | COUNTERTOP BAR CODE SYMBOL READING SYSTEM HAVING AUTOMATIC HAND-SUPPORTABLE BAR CODE SYMBOL READING DEVICE AND STAND FOR SUPPORTING PROJECTED SCAN FIELD THEREOF |
| 5,557,093 | December 28, 1994 | COMPACT PROJECTION LASER SCANNER FOR PRODUCING A NARROWLY CONFINED SCANNING VOLUME FOR OMNIDIRECTIONAL SCANNING OF CODE SYMBOLS THEREIN, WHILE PREVENTING UNINTENTIONAL SCANNING OF CODE SYMBOLS ON NEARBY OBJECTS |
| 5,528,024 | August 19, 1994 | DEVICE FOR SELECTIVELY READING CODE SYMBOLS IN SPATIALLY-DEFINED PORTIONS OF THE SCAN FIELD |
| 5,525,789 | August 19, 1994 | AUTOMATIC LASER BAR CODE SYMBOL READING SYSTEM AND METHOD OF READING BAR CODE SYMBOLS USING SAME |
| 5,496,992 | June 21, 1994 | DUAL TRIGGER MULTIPLEXED DATA ENTRY TERMINAL |
| 5,484,992 | November 24, 1993 | AUTOMATIC HAND-SUPPORTABLE LASER SCANNER WITH FLICKERING LASER SCANNING BEAM TO IMPROVE VISIBILITY THEREOF AND BEAM-SYMBOL ALIGNMENT DURING BAR CODE SYMBOL PRESENCE DETECTION |

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| 5,468,951 | August 19, 1994 | AUTOMATIC HAND-SUPPORTABLE CODE SYMBOL SCANNING DEVICE WITH IMPROVED LASER BEAM POINTING EFFICIENCY |
| 5,468,949 | June 11, 1993 | PORTABLE LASER DIODE SCANNING HEAD |
| 5,424,525 | November 4, 1993 | PORTABLE BAR CODE SYMBOL READING DEVICE WITH BAR CODE SYMBOL DETECTION CIRCUIT FOR ACTIVATING MICROPROCESSOR IMPLEMENTED BAR CODE SYMBOL DECODER |
| 5,420,411 | July 29, 1993 | COMBINED RANGE LASER SCANNER |
| 5,371,348 | October 16, 1992 | PORTABLE DEVICE FOR HANDSFREE DATA ENTRY WITH VARIABLY- POSITIONABLE DISPLAY/SCANNER MODULE DETACHABLE FOR HANDHELD USE |
| 5,354,977 | October 23, 1992 | OPTICAL SCANNING HEAD |
| 5,347,113 | March 25, 1993 | MULTIPLE-INTERFACE SELECTION SYSTEM FOR COMPUTER PERIPHERALS |
| 5,340,971 | September 17, 1991 | AUTOMATIC BAR CODE READING SYSTEM HAVING SELECTABLE LONG RANGE AND SHORT RANGE MODES OF OPERATION |
| 5,340,973 | June 12, 1992 | AUTOMATIC LASER SCANNING SYSTEM AND METHOD OF READING BAR CODE SYMBOLS USING SAME |
| 5,334,821 | July 16, 1992 | PORTABLE POINT OF SALE TERMINAL |
| 5,324,924 | May 11, 1992 | BAR CODE DECODER WITH CHANGEABLE WORKING RANGES |
| 5,294,782 | September 27, 1991 | INTEGRATED PORTABLE DEVICE FOR POINT OF SALE TRANSACTIONS |

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| 5,280,162 | January 25, 1993 | OBJECT SENSING SYSTEM FOR BAR CODE LASER SCANNERS |
| 5,272,324 | October 9, 1992 | PORTABLE SCANNER SYSTEM WITH TRANSCEIVER FOR TWO-WAY RADIO FREQUENCY COMMUNICATION |
| 5,272,323 | September 10, 1991 | DIGITIZER FOR BARCODE SCANNER |
| 5,262,627 | November 16, 1993 | SCANNING ARRANGEMENT AND METHOD |
| 5,260,553 | September 17, 1990 | AUTOMATIC HAND-SUPPORTABLE LASER BAR CODE SYMBOL SCANNER AND METHOD OF READING BAR CODE SYMBOLS USING THE SAME |
| 5,250,792 | August 18, 1992 | PORTABLE LASER DIODE SCANNING HEAD |
| 5,250,790 | June 12, 1992 | HAND-MOUNTED SCANNER WITH AUTOMATIC MANUAL INITIATION OF READING INDICIA |
| 5,247,162 | April 24, 1991 | PORTABLE LASER DIODE SCANNING HEAD HAVING A FOCUSING LENS AND AN APERTURE |
| 5,237,161 | June 5, 1991 | SYSTEM FOR AUTOMATICALLY READING SYMBOLS, SUCH AS BAR CODES, ON OBJECTS WHICH ARE PLACED IN THE DETECTION ZONE OF A SYMBOL READING UNIT, SUCH AS A BAR CODE SCANNER |
| 5,216,231 | August 8, 1991 | SELF-SCANNING CODE READING DEVICE |
| 5,212,370 | November 20, 1990 | APPARATUS AND METHOD FOR EXTENDING LASER LIFE BY DISCONTINUOUS OPERATION |
| 5,206,492 | August 5, 1991 | BAR CODE SYMBOL SCANNER WITH REDUCED POWER USAGE TO EFFECT READING |
| 5,198,650 | June 24, 1991 | HANDS FREE/HAND HELD BAR CODE |

SCANNER

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| 5,180,904 | October 24, 1991 | BAR CODE SCANNER WITH AUTOMATIC DE-ACTIVATION OF SCAN UPON BAR CODE RECOGNITION |
| 5,157,687 | December 19, 1990 | PACKET DATA COMMUNICATION NETWORK |
| 5,155,346 | December 10, 1990 | DEVICE FOR CONVERTING HAND- HELD SCANNER TO HANDS-FREE SCANNER TO HANDS-FREE SCANNER |
| 5,153,417 | August 6, 1990 | BAR CODE READER USING HOLOGRAMS |
| 5,149,950 | April 24, 1991 | HAND-HELD LASER SCANNING HEAD HAVING DETACHABLE HANDLE PORTION |
| 5,142,550 | December 28, 1990 | PACKET DATA COMMUNICATION SYSTEM |
| 5,132,523 | December 10, 1990 | DUAL MODE OPTICAL SCANNING SYSTEM |
| 5,107,100 | November 8, 1990 | PORTABLE SCANNER WITH ON-BOARD KEYBOARD, DISPLAY, TRANSCEIVER AND PRINTER |
| 5,086,215 | October 26, 1988 | METHOD AND APPARATUS FOR DISCRIMINATING OR LOCATING BAR CODES FOR AN OPTICAL MARK READER |
| 5,080,456 | February 26, 1990 | LASER SCANNERS WITH EXTENDED WORKING RANGE |
| 5,075,538 | October 16, 1989 | PORTABLE LASER DIODE SCANNING HEAD |
| 5,065,003 | March 12, 1990 | PORTABLE DATA INPUT/TRANSMISSION APPARATUS |
| 5,059,777 | September 21, 1989 | SCANNING SYSTEM PRESENCE SENSING APPARATUS AND METHOD |

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| 5,047,617 | April 2, 1990 | NARROW-BODIES, SINGLE- AND TWIN-WINDOWED PORTABLE LASER SCANNING HEAD FOR READING BAR CODE SYMBOLS |
| 5,029,183 | June 29, 1989 | PACKET DATA COMMUNICATION NETWORK |
| 5,021,641 | December 21, 1989 | HAND-HELD BAR CODE SCANNER WITH JOINTLY MOUNTED SCANNING MIRRORS |
| 5,019,698 | August 7, 1989 | BAR CODE READING SYSTEMS HAVING ELECTRICAL POWER CONSERVATION AND LASER RADIATION POWER LIMITING MEANS |
| 5,017,765 | December 21, 1989 | HAND HELD BAR CODE SCANNER WITH AUTOMATIC SCANNER DEENERGIZATION |
| 5,015,833 | February 23, 1990 | SCAN BOARD MODULE FOR LASER SCANNERS |
| 4,970,379 | October 12, 1988 | BAR CODE SCANNER SYSTEM AND SCANNER CIRCUITRY THEREFOR |
| 4,962,980 | January 23, 1989 | LASER SCANNER ENGINE WITH FOLDED BEAM PATH |
| 4,958,894 | January 23, 1989 | BOUNCING OSCILLATING SCANNING DEVICE FOR LASER SCANNING APPARATUS |
| 4,935,610 | December 15, 1988 | HAND-HELD BAR CODE READER |
| 4,933,538 | October 21, 1988 | SCANNING SYSTEM WITH ADJUSTABLE LIGHT OUTPUT AND/OR SCANNING ANGLE |
| 4,930,848 | January 26, 1989 | PORTABLE LASER SCANNER WITH INTEGRAL SCANNER ENGINE |
| Des. 305,885 | June 24, 1988 | HAND-HELD OPTICAL SCANNER |
| 4,897,532 | January 9, 1989 | PORTABLE LASER DIODE SCANNING HEAD |

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| 4,877,949 | August 8, 1986 | HAND-HELD INSTANT BAR CODE READER SYSTEM WITH AUTOMATED FOCUS BASED ON DISTANCE MEASUREMENTS |
| 4,845,349 | September 30, 1936 | BAR CODE SCANNER LASER EMISSION REDUCTION |
| 4,835,374 | August 9, 1988 | PORTABLE LASER DIODE SCANNING HEAD |
| 4,825,057 | January 26, 1988 | PORTABLE LASER DIODE SCANNING HEAD |
| 4,816,660 | May 19, 1988 | PORTABLE LASER DIODE SCANNING HEAD |
| 4,806,742 | January 26, 1988 | PORTABLE LASER DIODE SCANNING HEAD |
| 4,766,299 | March 28, 1986 | HAND-MOUNTED BAR CODE READER |
| 4,766,297 | January 8, 1987 | DUAL MODE STATIONARY AND PORTABLE SCANNING SYSTEM |
| 4,760,248 | October 29, 1987 | PORTABLE LASER DIODE SCANNING HEAD |
| 4,736,095 | February 20, 1986 | NARROW-BODIED, SINGLE- AND TWIN- WINDOWED PORTABLE LASER SCANNING HEAD FOR READING BAR CODE SYMBOLS |
| 4,713,785 | April 18, 1985 | METHOD OF INHIBITING PROCESSING OF DUPLICATIVE CODED LABEL SIGNALS |
| 4,673,805 | August 1, 1983 | NARROW-BODIED, SINGLE- AND TWIN- WINDOWED PORTABLE SCANNING HEAD FOR READING BAR CODE SYMBOLS |
| 4,647,143 | April 4, 1984 | LIGHT-BEAM SCANNING APPARATUS |
| 4,639,606 | October 26, 1984 | BAR CODE SCANNER LASER RADIATION EXPOSURE LIMIT- |

CONTROL SYSTEM

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| 4,621,189 | October 8, 1985 | HAND HELD DATA ENTRY APPARATUS |
| 4,593,186 | October 20, 1983 | PORTABLE LASER SCANNING SYSTEM AND SCANNING METHODS |
| 4,575,625 | September 27, 1983 | INTEGRAL HAND-HELD LASER SCANNER |
| 4,570,057 | August 6, 1984 | INSTANT PORTABLE BAR CODE READER |
| 4,521,678 | January 23, 1984 | BATTERY-POWERED OPTICAL BAR CODE READER AND VOLTAGE REGULATOR THEREFOR |
| 4,496,831 | November 16, 1981 | PORTABLE LASER SCANNING SYSTEM AND SCANNING METHODS |
| 4,465,926 | March 5, 1982 | OPTICAL READING DEVICE FOR THE MANUAL OPTICAL SCANNING AND FOR EVALUATING OPTICALLY READABLE CHARACTER CODES |
| 4,460,120 | August 1, 1983 | NARROW BODIED, SINGLE, AND TWIN- WINDOWED PROTABLE LASER SCANNING HEAD FOR READING BAR CODE SYMBOLS |
| 4,431,912 | November 13, 1981 | METHOD FOR CONTROLLING THE OPERATION OF AN OPTICAL SCANNER |
| 4,409,470 | January 25, 1982 | NARROW-BODIED, SINGLE-AND TWIN- WINDOWED PORTABLE LASER SCANNING HEAD FOR READING BAR CODE SYMBOLS |
| 4,387,297 | February 29, 1980 | PORTABLE LASER SCANNING SYSTEM AND SCANNING METHODS |
| 4,282,425 | August 4, 1981 | INSTANT PORTABLE BAR CODE READER |
| 4,279,021 | February 15, 1979 | PORTABLE DATA ENTRY APPARATUS INCLUDING PLURAL SELECTABLE FUNCTIONAL CONFIGURATIONS |

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| 4,240,064 | December 16, 1980 | POWER LIMITING CIRCUIT FOR BAR CODE READER |
| 4,086,476 | July 29, 1976 | CONTROL CIRCUIT FOR A CODE READING DEVICE |
| 4,072,859 | October 4, 1976 | WAND TURN-ON CONTROL |

FOREIGN PUBLICATIONS

| <u>NUMBER</u> | <u>PUBLICATION DATE</u> | <u>TITLE</u> |
|----------------------|--------------------------------|---|
| EP 0 871 138 A2 | October 14, 1998 | METHOD AND APPARATUS FOR AUTOMATICALLY READING BAR CODE SYMBOLS |
| EP 460 669 | November 12, 1991 | SYMBOL READ DEVICE |
| 0 424 976 A2 | May 2, 1991 | DATA READING DEVICE AND CONTROL SYSTEM HAVING DATA READING DEVICE |
| 0 424 097 A1 | April 24, 1991 | ARTICLE DETECTION DEVICE AND METHOD FOR DETECTING THE ARTICLE |
| 0 414 452 A1 | February 27, 1991 | HAND-HELD BAR CODE READER |
| 0 323 848 | July 12, 1989 | OPTICAL IMAGE READING DEVICE |

TECHNICAL PUBLICATIONS

The web-based publication entitled "Pocket-Sized Computing for Mobile Industry Professionals" by Symbol Technologies, Inc., <http://www.smbol.com/wp/stwp0006.htm>, 1998, pages 1-3.

The 1998 press release entitled "Symbol Adds Functionality to PalmPilot" by Symbol Technologies, Inc., <http://www.symbol.com/press.100pr.htm>, March 23, 1998, pages 1-2.

The product brochure for the MH290 Hand Held Laser Scanner by Metrologic Instruments, Inc., 1987, pages 1-2.

The technical publication entitled "Hand-Held Holographic Scanner Having Highly Visible Locator Beam" by R.T. Cato, IBM Technical Disclosure Bulletin, Vol. 27, No. 4, September 1984, pages 2021-2022.

INTERNATIONAL SEARCH REPORTS

| <u>App. No.</u> | <u>Filing Date</u> |
|-----------------|--------------------|
| PCT/US99/28530 | December 2, 1999 |
| EP 0 871 138 A2 | September 17, 1992 |

STATEMENT OF PERTINENCE

U.S. Patent No. 6,182,898 by Schmidt et al. (to which the present Application claims priority) discloses a fully automatic bar code symbol reading system comprising an automatic (i.e., triggerless) portable bar code symbol reading device with an omnidirectional projection laser scanning engine mounted within the head portion of its hand-supportable housing, and an associated base unit positioned within the data transmission range thereof without a physical wiring connection thereto. The hand-supportable bar code symbol reading device produces a narrowly confined scanning volume for omnidirectional scanning of code symbols presented therein, while preventing unintentional scanning of code symbols on nearby objects located outside thereof.

U.S. Patent No. 6,158,662 to Kahn et al. discloses a system of reading indicia such as bar code symbols having a scanner for generating a scanning light beam directed toward a symbol to be read. A trigger manually displaceable from a first position to a second position produces a first light beam for aiming or positioning the reader. The trigger is automatically returnable, or held in the second position, or manually displaceable from the second position to the first position for initiating a scanning beam pattern for reading the symbol. A detector receives the reflected light from the symbol and produces electrical signals corresponding to data represented by the symbol.

U.S. Patent No. 5,945,660 to Nakasuji et al. discloses a communication system for a wireless bar code reader which includes a wireless bar code reader transmitter for reading bar code information and transmitting a radio signal, and a receiver for receiving the radio signal from the wireless bar code reader transmitter and transmitting reception data to a host computer, wherein the receiver includes a reception indication section for indicating that the reception data is received. Accordingly, it is possible to notify an operator that the data has been transmitted normally and further to urge the operator to retransmit the data when the data has not been transmitted normally.

U.S. Patent No. 5,828,049 to Knowles et al. discloses a bar code symbol reading system having a laser scanner, and a multi-port digital signal decode capable of decoding digital signals produced from various types of scanning devices including, for example, high-speed counter top scanners, low-speed hand-held scanners, wand scanners, light pen scanners, and magnetic card

scanners. The digital signal decoder includes a plurality of data input ports for receiving digital input signals produced from the various scanning devices. The digital signal decoder also includes common digital signal and data processing circuitry for processing the digital input signals and digital data so as to produce, as output, decoded symbol data. In addition, the digital signal decoder further includes an output data port for providing the decoded symbol data to a host device operably connected to the digital signal decoder. In the illustrative embodiment, the digital signal decoder is realized using VLSI circuit and microprocessor technology.

U.S. Patent No. 5,828,048 to Rockstein et al. discloses a bar code symbol reading system with automatic modes of hand-held (i.e., hands-on) and stand-supported (i.e., hands-free) operation. In the hand-held mode of automatic operation, the user initiates laser scanning by simply bringing the object within at least a portion of the scan field of the automatic bar code symbol reading device. In the stand-supported mode of automatic operation, a scanner support stand is used to support the automatic bar code symbol reading device relative to a countertop surface so that the scan field is projected away from the scanner support stand and the hand-supportable housing, and extends above the countertop surface permitting the automatic reading bar code symbols on goods passed thereby. This way, during the scanner-supported mode of automatic operation, a bar code symbols on an object of virtually any size can be automatically read when the object is automatically detected in the outwardly projected scan field while the hand-supportable bar code symbol reading device is supported within the scanner support stand.

U.S. Patent No. 5,825,012 to Rockstein et al. discloses a method and apparatus for automatically reading bar code symbols. One aspect of the present invention concerns a method of reading bar code symbols using an automatic hand-holdable bar code symbol reading device. In general, the automatic bar code symbol reading device comprises a hand-holdable housing containing operative elements which provide an object detection field and a scan field each defined external to the housing. The method involves automatically detecting the presence of an object within the object detection field by sensing object sensing energy reflected off the object. In a preferred embodiment, the object sensing energy is IR radiation produced from an object sensing energy source disposed within the housing. In automatic response to the detection of the object within the object detection field, the hand-holdable device detects the presence of a bar code within the scan field using a laser beam produced within the housing. Then, in automatic response to the detection of a bar code in the scan field, the automatic hand-holdable bar code symbol reading device reads the detected bar code in the scan field by producing scan data signals from the detected bar code and thereafter collecting and analyzing the same. Another aspect of the present invention concerns a hand-holdable data collection device adapted for use with the automatic bar code symbol reading device to form a portable symbol reading system characterized by versatility and simplicity of use.

U.S. Patent No. 5,808,285 to Rockstein et al. discloses a fully automatic bar code symbol reading system having at least one automatic portable bar code symbol reading device, and an associated base unit positioned within the data transmission range thereof without a physical wiring connection thereto. After each successful reading of a bar code symbol, the bar code symbol reading device automatically produces symbol character data representative of the decoded bar code symbol, synthesizes a group of data packets each containing the symbol character data, and then transmits the synthesized group of data packets to the base unit. Upon the successful receipt of one of the transmitted data packets and the recovery of symbol character

therefrom, the base unit generates an acoustical acknowledgement signal that is perceptible to the user of the bar code symbol reading device and indicates the transmitted symbol character data has been successfully received. In typical applications, a plurality of such bar code systems are used in physical proximity with each other, such as in conventional retail point-of-purchase environments. In accordance with the present invention, radio frequency carrier signals of the same frequency are used by each hand-supportable bar code symbol reading device to transmit groups of data packets to respective base units. Data package interference at each base unit is minimized during data packet reception by using a novel data packet transmission scheme.

U.S. Patent No. 5,796,091 to Schmidt et al. discloses a fully automatic bar code symbol reading system having an automatic (i.e., triggerless) portable bar code symbol reading device with an omnidirectional projection laser scanning engine mounted within the head portion of its hand-supportable housing, and an associated base unit positioned within the data transmission range without a physical wiring connection. The hand-supportable bar code symbol reading device produces a narrowly confined scanning volume for omnidirectional scanning of the code symbols presented, while preventing unintentional scanning of code symbols on nearby objects located outside the scanning volume.

U.S. Patent No. 5,789,731 to Amundsen et al. discloses a laser bar code symbol scanner embodying a narrow band-pass optical filtering system of novel construction. A first optical filter element is installed over the light transmission aperture of the scanner housing, and has wavelength selective properties which transmit only light having wavelengths from slightly below a predetermined wavelength in the visible band of the electromagnetic spectrum (e.g., greater than slightly below 670 nanometers). A second optical filter element is installed within the housing, along the focused laser return light path between the light focusing element and the light detecting element, and transmits only light having wavelengths from slightly above the predetermined wavelength (e.g., less than slightly above 670 nanometers). Collectively, the first and second optical filter elements cooperate to form a narrow wavelength band-pass filtering system centered about the predetermined wavelength, providing improved signal-to-noise ratio. As a result of the present invention, aesthetically unappealing electro-optical components mounted within the scanner housing are hidden from plain view, while the optical filtering elements of the system can be easily and inexpensively manufactures and used without compromising the signal-to-noise ratio performance of the laser scanner.

U.S. Patent No. 5,789,730 to Rockstein et al. discloses a method and apparatus for reading bar code symbols using a substrate hand-holdable bar code symbol reading device. In general, the automatic bar code symbol reading device comprises a hand-holdable housing containing operative elements which provide an object detection field and a scan field each defined external to the housing. The method involves automatically detecting the presence of an object within the object detection field by sensing object sensing energy reflected off the object. In a preferred embodiment, the object sensing energy is IR radiation produced from an object sensing energy source disposed within the housing. In automatic response to the detection of the object within the object detection field, the hand-holdable device detects the presence of a bar code within the scan field using a laser beam produced within the housing. Then, in automatic response to the detection of a bar code in the scan field, the automatic hand-holdable bar code symbol reading device reads the detected bar code in the scan field by producing scan data signals from the detected bar code and thereafter collecting and analyzing the same. Another aspect of the present

invention concerns a hand-holdable data collection device adapted for use with the automatic bar code symbol reading device to form a portable symbol reading system characterized by versatility and simplicity of use.

U.S. Patent No. 5,786,582 to Roustaei et al. discloses an optical device for reading one- and two-dimensional symbologies at variable depths of field, the device including a light source for projecting an emitted light towards the two-dimensional image and an optical assembly, or zoom lens, with dual field of view capability for focusing light reflected from the framed symbology onto a CCD detector for detecting the focused light and generating a signal therefrom. The dual field of view capability enables scanning of both wide and narrow fields of view. An apodizing filter is provided within the optical assembly to increase depth of field. Aiming of the sensor to read the symbology is facilitated by a frame locator including a laser diode which emits a beam that is modified by optics, including diffractive optics, to divide the beam into beamlets having a spacing therebetween that expands to match the dimensions of the field of view of the sensor, forming points of light at the target to define the edges of the field of view. One or two sets of diffractive optics may be provided, with one set corresponding to each position, for each of the dual field of view positions of the zoom lens.

U.S. Patent No. 5,777,315 to Wilz et al. discloses a novel system and method programming the function parameters of programmable bar code symbol readers and scanners, while avoiding the need to couple the data communication port of a function parameter computer system and the programmable bar code symbol reader to be configured. In a first illustrative embodiment, the function-encoded parameters of a master bar code symbol reader are determined using a computer-based-function-parameter device and subsequently buffered in memory buffer contained therein; the buffered function-encoded parameters are used to produce a list of function-encoded bar code symbols which are printed in a specified reading sequence; and the list of printed-function encoded bar code symbols are read in the specified reading sequence so as to configure the bar code symbol reader with the same set of function-encoded parameters that were programmed in the master bar code symbol reader. In a second illustrative embodiment, the function-encoded parameters of a master bar code symbol reader are determined using a computer based-function-parameter acquisition device and buffered in a memory buffer contained therein; the buffered function-encoded parameters are used to produce a list of symbol reading instructions, each referencing a specific function encoded bar code symbol on a particular page of a preprinted bar code symbol programming guide, and the list of symbol reading instructions are used to read in a specified order.

U.S. Patent No. 5,767,501 to Schmidt et al. discloses a fully automatic bar code symbol reading system which has an automatic (i.e., triggerless) portable bar code symbol reading device with an omnidirectional projection laser scanning engine mounted within the head portion of its hand-supportable housing, and an associated base unit positioned within the data transmission range of the portable unit without a physical wiring connection to the portable unit. The hand-supportable bar code symbol reading device produces a narrowly confined scanning volume for omnidirectional scanning of code symbols presented within the scanning volume, while preventing unintentional scanning of code symbols on nearby objects located outside of the scanning volume.

U.S. Patent No. 5,756,982 to Knowles et al. discloses a portable automatic code symbol

reading system having a laser scanning engine mounted upon the hand of its operator to provide hands-free automatic laser scanning capabilities. The automatic code symbol reading system includes a battery power supply aboard its hands-mounted housing, and a power-conserving control subsystem for conserving the consumption of electrical power during automatic portable laser scanning operations. The control subsystem of the present invention has a plurality of control centers which control the operation of the system components in accordance with preselected system control operations. Each of the control centers is responsive to control activation signals generated by certain of the system components upon the occurrence of predefined conditions. Certain of the control centers are capable of overriding other control centers to provide diverse control capabilities. These control capabilities facilitate execution of intelligent functions and power consumption measures required during automatic, hands-free code symbol reading operations.

U.S. Patent No. 5,742,043 to Knowles et al. discloses a portable automatic code symbol reading system having a laser scanning engine mounted upon the hand of its operator to provide hands-free automatic laser scanning capabilities. The automatic code symbol reading system includes a battery power supply aboard its hand-mounted housing, and a power-conserving control subsystem for conserving the consumption of electrical power during automatic portable laser scanning operations. The control subsystem of the present invention has a plurality of control centers which control the operation of the system components in accordance with preselected system control operations. Each of the control centers is responsive to control activation signals generated by certain of the system components upon the occurrence of predefined conditions. Certain of the control centers are capable of overriding other control centers to provide diverse control capabilities. These control capabilities facilitate execution of intelligent functions and power consumption measures required during automatic, hands-free code symbol reading operations.

U.S. Design Patent No. 385,265 to Knowles et al. discloses an ornamental design for a hand-supportable laser scanner.

U.S. Patent No. 5,736,982 to Suzuki et al. discloses a plurality of terminals connected to a server via a communication network, that share a predetermined common virtual space. The terminals each send to the server the position coordinates of the viewing point and direction of the eyes of its user in the virtual space, and the visual field image viewed from that viewing point is displayed on a display. Based on the position coordinates and direction of eyes of the avatar each of the other terminals received from each of the other terminals via the server, each terminal generates an avatar image in the specified direction and at the specified position and displays it in the visual field. The server is always supplied with the latest position information of the avatar from every terminal, and, when the distance between two arbitrary avatars becomes smaller than a threshold value, connects speech channels of the two terminals corresponding to these avatars.

U.S. Patent No. 5,661,292 to Knowles et al. discloses an automatic projection laser scanning system for reading bar code symbols. The system is supportable on or above a countertop surface, and includes a laser scanning device having a compact housing from which it automatically produces an object detection field of volumetric expanse for automatic detection of objects, and a scan field including at least one scanning plane for automatic laser scanning of code symbols on detected objects. Both the object detection field and the scan field spatially arranged

with respect to each other and the compact housing to facilitate easy scanning of a bar code symbol presented within the scan field after the associated object has been detected within the object detection field, thereby improving the scanning efficiency of the system.

U.S. Patent No. 5,637,852 to Knowles et al. discloses a bar code scanner for stationary disposition at a counter to projecting a scanning pattern comprising first, second, third, fourth and fifth groups of parallel scan lines within a relatively narrow, yet diverging, volume, e.g., pyramid, cone, etc., centered about a projection axis. The scanner includes a compact housing mounted on an adjustable base. The housing includes a window, five stationary mirrors, a laser diode, rotating reflective polygon for sweeping the laser beam from the diode across the mirrors and out a window so that the projection axis is substantially but not precisely perpendicular to the window. The scanner also includes a fixed curved collecting mirror and a concentrating lens to focus light which is reflected off of a bar code to a photodetector. One mirror extends along an axis parallel to the transverse axis to produce the first group of scan lines. The second and third mirrors are disposed opposite each other close to and laterally of the polygon and extending along respective axes at a small acute angle, e.g., 8 degrees, to the longitudinal axis to produce respective ones of the second and third group of scan lines. The fourth and fifth mirrors are disposed between the second and third reflecting mirrors, respectively, and each extends along a respective axis at a substantial acute angle, e.g., 48 degrees, to the longitudinal axis to produce respective ones of the fourth and fifth group of scan lines.

U.S. Patent No. 5,627,359 to Amundsen et al. discloses a laser bar code symbol scanner embodying a narrow band-pass optical filtering system of novel construction. A first optical filter element is installed over the light transmission aperture of the scanner housing, and has wavelength selective properties which transmit only light having wavelengths from slightly below a predetermined wavelength in the visible band of the electromagnetic spectrum (e.g., greater than slightly below 670 nanometers). A second optical filter element is installed within the housing, along the focused laser return light path between the light focusing element and the light detecting element, and transmits only light having wavelengths from slightly above the predetermined wavelength (e.g., less than slightly above 670 nanometers). Collectively, the first and second optical filter elements cooperate to form a narrow wavelength band-pass filtering system centered about the predetermined wavelength, providing improved signal-to-noise ratio. As a result of the present invention, aesthetically unappealing electro-optical components mounted within the scanner housing are hidden from plain view, while the optical filtering elements of the system can be easily and inexpensively manufactured and used without compromising the signal-to-noise ratio performance of the laser scanner.

U.S. Patent No. 5,616,908 to Wilz et al. discloses a fully automatic bar code symbol reading system having a hand-supportable laser bar code reading device. The system has a number of operative states including an object detection state, a bar code presence detection state and a bar code symbol decoding state. During bar code symbol presence detection state, the visibly laser scanning beam produced from the hand-supportable device flickers at a rate which improves the visual conspicuousness of the laser scanning beam in the scan field. The flicker characteristics of the laser scanning beam makes it substantially easier for the user to visually align the laser scanning beam with the bar code symbol on the detected object. Consequently, reading bar code symbols is made substantially easier using the automatic laser bar code symbol reading device of the present invention.

US Patent No. 5,610,386 to Ball et al. discloses a hand-mounted laser scanner which includes a trigger switch 60 designed for operation by the user's thumb pushing in the direction of arrow 63, shown in Fig. 3.

U.S. Patent No. 5,600,121 to Kahn et al. discloses a system for reading indicia such as bar code symbols having a scanner for generating a scanning light beam directed toward a symbol to be read; a first actuator manually displaceable from a first position to a second position for producing a first light beam for aiming or positioning the reader, and a second actuator manually displaceable from a first position to a second position for initiating a scanning beam pattern for reading the symbol. The actuators are independently operative of each other. A detector receives the reflected light from the symbol and produces electrical signals corresponding to data represented by the symbol. A graphical user interface simplifies system control functions.

U.S. Patent No. 5,591,953 to Rockstein et al. discloses an automatic bar code symbol reading system comprising components for carrying out object detection, scanning, photoreceiving, A/D conversion, bar code presence detection, symbol decoding, data format conversion, data storage and data transmission functions. In general, the bar code symbol reading device includes a control system having a plurality of control centers that control the operation of the system components in accordance with preselected system control operations. Each of the control centers are responsive to activation signals generated by certain of the system components upon the occurrence of predefined conditions. Certain of the control centers are capable of overriding other control centers to provide diverse control capabilities which facilitates execution of intelligent operations and power consumption, during bar code symbol reading.

U.S. Patent No. 5,557,093 to Knowles et al. discloses a bar code scanner for stationary disposition at a counter to projecting a scanning pattern comprising first, second, third, fourth and fifth groups of parallel scan lines within a relatively narrow, yet diverging, volume, e.g., pyramid, cone, etc., centered about a projection axis. The scanner includes a compact housing mounted on an adjustable base. The housing includes a window, five stationary mirrors, a laser diode, a rotating reflective polygon for sweeping the laser beam from the diode across the mirrors and out a window so that the projection axis is substantially but not precisely perpendicular to the window. The scanner also includes a fixed curved collecting mirror and a concentrating lens to focus light which is reflected off of a bar code to a photodetector. One mirror extends along an axis parallel to the transverse axis to produce the first group of scan lines. The second and third mirrors are disposed opposite each other close to and laterally of the polygon and extending along respective axes at a small acute angle, e.g., 8 degrees, to the longitudinal axis to produce respective ones of the second and third group of scan lines. The fourth and fifth mirrors are disposed between the second and third reflecting mirrors, respectively, and each extends along a respective axis at a substantial acute angle, e.g., 48 degrees, to the longitudinal axis to produce respective ones of the fourth and fifth group of scan lines.

U.S. Patent No. 5,528,024 to Rockstein et al. discloses a method and apparatus for automatically reading bar code symbols. One aspect of the present invention concerns a method of reading bar code symbols using an automatic hand-holdable bar code symbol reading device. In general, the automatic bar code symbol reading device comprises a hand-holdable housing containing operative elements which provide an object detection field and a scan field each

defined external to the housing. The method involves automatically detecting the presence of an object within the object detection field by sensing object sensing energy reflected off the object. In a preferred embodiment, the object sensing energy is IR radiation produced from an object sensing energy source disposed within the housing. In automatic response to the detection of the object within the object detection field, the hand-holdable device detects the presence of a bar code within the scan field using a laser beam produced within the housing. Then, in automatic response to the detection of a bar code in the scan field, the automatic hand-holdable bar code symbol reading device reads the detected bar code in the scan field by producing scan data signals from the detected bar code and thereafter collecting and analyzing the same. Another aspect of the present invention concerns a hand-holdable data collection device adapted for use with the automatic bar code symbol reading device to form a portable symbol reading system characterized by versatility and simplicity of use.

U.S. Patent No. 5,525,789 to Rockstein et al. discloses a method and apparatus for automatically reading bar code symbols. One aspect of the present invention concerns a method of reading bar code symbols using an automatic hand-holdable bar code symbol reading device. In general, the automatic bar code symbol reading device comprises a hand-holdable housing containing operative elements which provide an object detection field and a scan field each defined external to the housing. The method involves automatically detecting the presence of an object within the object detection field by sensing object sensing energy reflected off object. In a preferred embodiment, the object sensing energy is IR radiation produced from an object sensing energy source disposed within the housing. In automatic response to the detection of the object within the object detection field, the hand-holdable device detects the presence of a bar code within the scan field using a laser beam produced within the housing. Then, in automatic response to the detection of a bar code in the scan field, the automatic hand-holdable bar code symbol reading device reads the detected bar code in the scan field by producing scan data signals from the detected bar code and thereafter collecting and analyzing the same. Another aspect of the present invention concerns a hand-holdable data collection device adapted for use with the automatic bar code symbol reading device to form a portable symbol reading system characterized by versatility and simplicity of use.

U.S. Patent No. 5,496,992 to Madan et al. discloses a handheld data entry terminal that, upon initialization of a data entry program downloaded from a host computer, is capable of capturing product data, through either a terminal scanner or a data entry keypad, at locations remote from the host computer. A data entry program is downloaded to a battery-powered data entry terminal from a central host computer via a RF data transceiver located in the terminal. If the terminal scanner is functional and the product contains the necessary coded representations of data, the scanner may be enabled, through a first trigger located on a terminal handle, to scan the coded representations of data. Alternatively, the terminal operator may enter alpha/numeric product data through the terminal keypad. The data entry program contains a stack of key definition tables for the terminal keypad, allowing the terminal to be designed with a minimum number of data entry keys and a terminal display of maximum size. If the keypad mode of data entry is used, the terminal operator may scroll through the alternate key definition tables by using certain command keys, or via a second trigger located on the terminal handle, to select the proper key definition table for a particular mode of data entry or to select a particular data entry command. Regardless of the mode of data entry used, the data entered into the terminal is stored in a buffer at the terminal. Once all data has been entered into the buffer, the processor, upon

receiving a SEND command, sends the data to the host computer via the terminal RF transceiver.

U.S. Patent No. 5,484,992 to Wilz et al. discloses a fully automatic bar code symbol reading system having a hand-supportable laser bar code reading device. The system has a number of operative states including an object detection state, a bar code presence detection state and a bar code symbol decoding state. During bar code symbol presence detection state, the visible laser scanning beam produced from the hand-supportable device flickers at a rate which improves the visual conspicuousness of the laser scanning beam in the scan field. The flicker characteristics of the laser scanning beam makes it substantially easier for the user to visually align the laser scanning beam with the bar code symbol on the detected object. Consequently, reading bar code symbols is made substantially easier using the automatic laser bar code symbol reading device of the present invention.

While not a prior art reference, Applicants cite U.S. Patent No. 5,468,951 to Knowles et al. as it discloses a laser scanning bar code symbol reader into which the present invention may be embodied in accordance with the inventive principles thereof.

U.S. Patent No. 5,468,949 to Swartz et al. discloses a portable laser diode scanning head, aimable at each symbol to be read, emits and receives non-readily-visible laser light, and is equipped with a trigger-actuated aiming light arrangement for visually locating and tracking each symbol. A compact laser diode optical train and an optical folded path assembly, as well as an interchangeable component design and an integral window construction for the head also are disclosed.

U.S. Patent No. 5,424,525 to Rockstein et al. discloses an automatic bar code symbol reading system comprising components for carrying out object detection, scanning, photoreceiving, A/D conversion, bar code presence detection, symbol decoding, data format conversion, data storage and data transmission functions. In general, the bar code symbol reading device includes a control system having a plurality of control centers that control the operation of the system components in accordance with preselected system control operations. Each of the control centers are responsive to control activation signals generated by certain of the system components upon the occurrence of predefined conditions. Certain of the control centers are capable of overriding other control centers to provide diverse control capabilities which facilitates execution of intelligent operations and power consumption, during bar code symbol reading.

U.S. Patent No. 5,420,411 to Salatto, Jr., et al. discloses a hand-held laser scanner which uses two (2) laser diode "illumination systems" optimally focused for different working ranges (e.g., short range from 0 to 2 feet, and long-range from 2 to 17 feet).

While not a prior art reference, Applicant cites U.S. Patent No. 5,371,348 to Kumar et al. as it discloses a portable device having a keyboard and a removable scanning module.

While not a prior art reference, Applicants cite U.S. Patent No. 5,354,977 to Roustaei as it discloses a low battery detector.

While not a prior art reference, Applicants cite U.S. Patent No. 5,347,113 to Reddersen et al. as it discloses a bar code symbol reader connected to a key entry data terminal.

U.S. Patent No. 5,340,971 to Rockstein et al. discloses a method and apparatus for automatically reading bar code symbols. One aspect of the present invention concerns a method of reading bar code symbols using an automatic hand-holdable bar code symbol reading device. In general, the automatic bar code symbol reading device comprises a hand-holdable housing containing operative elements which provide an object detection field and a scan field, each defined external to the housing. The method involves automatically detecting the presence of an object within the object detection field by sensing energy reflected off the object. In a preferred embodiment, the object sensing energy is IR radiation produced from an energy which reflects off the object source disposed within the housing. In automatic response to the detection of the object within the object detection field, the hand-holdable device detects the presence of a bar code within the scan field using a laser beam produced within the housing. In automatic response to the detection of the object within the object detection field, the hand-holdable device detects the presence of a bar code within the scan field using a laser produced within the housing. Then, in automatic response to the detection of a bar code in the scan field, the automatic hand-holdable bar code symbol reading device reads the detected bar code in the scan field by producing scan data signals from the detected bar code and thereafter collecting and analyzing the same. Another aspect of the present invention concerns a hand-holdable data collection device adapted for use with the automatic bar code symbol reading device to form a portable symbol reading system characterized by versatility and simplicity of use.

While not a prior art reference, Applicants cite U.S. Patent No. 5,340,973 to Knowles et al. as it discloses a laser scanning bar code symbol reader into which the present invention may be embodied in accordance with the inventive principles thereof.

While not a prior art reference, Applicants refer to U.S. Patent No. 5,334,821 to Campo et al. as it discloses a portable point of sale (POS) terminal having a keyboard, display, data storage memory, and an RF telecommunication link associable with a bar code symbol scanner.

U.S. Patent No. 5,324,924 to Cai et al. discloses an arrangement for decoding a bar code symbol in which the data resulting from scanning a bar code symbol with a bar code scanner is evaluated to determine if the scanned bar code symbol is within the working range of the scanner. The data acquired by the bar code scanner is evaluated to determine if the detected widths of the bars and spaces of the scanned bar code symbol are too small, less than a threshold value, which indicates that the bar code symbol is too far and outside of the working range of the scanner. Moreover, the working range of the bar code scanner can be selectively changed by changing the threshold value, which can be easily implemented by having the bar code scanner scan a menu bar code which instructs the decoder to change the threshold value to a selected new value which may be pre-established for the particular operation. The arrangement preferably includes software to process the data acquired by the bar code scanner, and if the data indicates that the scanning distance to the bar code is too far, a flag is set in the software which prevents a new decode result from being recorded. However, the intermediate decode result is retained in memory to indicate that the bar code symbol is still in the scanner's field of view. A second evaluation validation to determine if the detected bar code symbol is valid may also be performed.

US Patent No. 5,294,782 to Kumar discloses a hand-held transaction terminal having a manually-actuatable bar code symbol scanner.

U.S. Patent 5,280,162 to Marwin discloses a bar code laser scanning system, which uses an object detection circuit to initiate bar code symbol reading.

U.S. Patent No. 5,272,324 to Blevins discloses a body-wearable laser scanner, in which a bar code scanner is provided for reading bar code symbols and a power pack and RF transceiver is worn on the torso of the operator to provide a communication link with a host computer.

U.S. Patent No. 5,272,323 to Martino discloses a bar code scanner which employs a digitizer for the signal produced by a photodetector in response to light reflected from a bar code symbol. The digitizer uses a first derivative of the signal to detect peaks, and determines the amount of movement of the signal after each peak to see if a threshold amount of movement has occurred. A second derivative of the signal is used to detect inflection points, and when one occurs after the threshold amount of movement following a peak, a valid transition of the signal is signaled. These valid transitions are decoded to recover the bar code pattern. The threshold used is adjustable to optimize the digitizing for different types of bar code symbols and other conditions, or to provide a squelch function. Dynamic control of the threshold provides a varying response to the scanned bar code symbol. Zero-crossing detectors used with the first and second derivative circuits may also have variable thresholds.

U.S. Patent No. 5,262,627 to Shepart discloses a manually-activated hand-held laser scanner.

U.S. Patent No. 5,260,553 to Rockstein et al. discloses an automatic bar code symbol reading system comprising components for carrying out object detection, scanning, photoreceiving, A/D conversion, bar code presence detection, symbol decoding, data format conversion, data storage and data transmission functions. In general, the bar code symbol reading device includes a control system having a plurality of control centers that control the operation of the system components in accordance with preselected system control operations. Each of the control centers are responsive to control activation signals generated by certain of the system components upon the occurrence of predefined conditions. Certain of the control centers are capable of overriding other control centers to provide diverse control capabilities which facilitate execution of intelligent operation and power conservation during bar code symbol reading.

U.S. Patent No. 5,250,792 to Swartz et al. discloses a portable laser diode scanning head, aimable at each symbol to be read, which emits and receives non-readily-visible laser light, and is equipped with a trigger-actuated aiming light arrangement for visually locating and tracking each symbol. A compact laser diode optical train and an optical folded path assembly, as well as an interchangeable component design and an integral window construction for the head also are disclosed.

U.S. Patent 5,250,790 to Melitsky et al. discloses a hand-mounted scanner, with a proximity detector to initiate bar code symbol reading.

U.S. Patent No. 5,247,162 to Swartz et al. discloses a portable laser diode scanning head, aimable at each symbol to be read, which emits and receives non-readily-visible laser light, and is equipped with a trigger-actuated aiming light arrangement for visually locating and tracking each

symbol. A compact laser diode optical train and an optical folded path assembly, as well as an interchangeable component design and an integral window construction for the head also are disclosed. Also disclosed is an optic means mounted in the laser diode scanning head including a focusing lens and an aperture stop for forming the emitted laser light to have a beam cross-section of an altered size within a working distance range.

U.S. Patent No. 5,237,161 to Grodevant discloses a bar code symbol reading system having a stand-supported mode of operation and a hand-supported mode of operation.

U.S. Patent No., 5,216,231 to Ouchi discloses a CCD bar code reader which comprises: a photo-electric converting portion (consisting of self-scanning type CCD line sensor; focusing optical system, digitizer etc.); an edge detecting portion for detecting the turning points of the two-value level signal from photo-electric converting portion; a counting portion for counting the number of clock signals between two adjacent edge signals detected at the edge detecting portion; a start-stop judging portion for detecting a start code and stop code; a decoding portion responsive to start-stop judging portion, for decoding the count value produced from the counting portion, for decoding the count value produced from the counting portion, and thereupon producing a control signal to output control portion, and decoded bar code symbol data to output control portion and switch; and output control portion having first data memory, second data memory, and a data compositor whose outputs are connected to switch. Decoded bar code symbol data produced at the present time is stored in first data memory, whereas decoded bar code symbol data produced at the last interval is stored in second data memory. During operation, data comparator compares the data stored in these memories and the last decoded bar code symbol data is transmitted to an information processing device only when the two decoded bar code symbol data items differ from each other.

U.S. Patent No. 5,212,370 to Wittensoldner et al. discloses a laser bar code symbol scanning system, in which (i) a laser beam produced by a laser diode is driven in a discontinuous mode of operation, and (ii) the reflected light from items in its scan field (i.e., "target area") is detected and the electrical signals produced therefrom are analyzed to determine whether a bar code is present in the scan field. If so, then the laser diode is driven into a continuous mode of operation. If no bar code symbol is detected in the scan field, then the laser diode remains driven in its discontinuous mode of operation.

U.S. Patent No. 5,206,492 to Shepard et al. discloses a low-cost scanner for reading bar code symbols that saves electrical power consumption by oscillating one of the scanner components either by mechanical power alone or by a low-power electrical drive.

U.S. Patent No. 5,198,650 to Wilke, Jr. discloses a hands-free/hand-held bar code scanning system, in which a manually-trigger actuated hand-held laser scanner can be operated in a hand-held mode of operation when lifted off the post portion of base, and alternatively operated in hands-free mode when supported on post portion. As disclosed, the scanner module contained within the egg-shaped housing of the scanner projects a scanning light beam when operated upon actuation of switch number 27, shown in Fig. 1.

U.S. Patent No. 5,180,904 to Shepard et al. is a Division of U.S. Patent 5,230,520, and discloses a manually-triggered bar code scanner which automatically deactivates its laser light

source and scanner motor in response to decoding a bar code signal.

U.S. Patent No. 5,157,687 to Tymes discloses a packet data transmission system used to link a number of remote hand-held data-gathering units such as bar code readers to a central computer which maintains a database management system. Data packets are sent from the remote units by an RF link to intermediate base stations, then sent by the base stations to the central computer by a serial link. Direct sequence spread spectrum modulation is used for the RF link. The remote hand-held units initiate an exchange using RF transmission to and from the base stations, receiving only during a rigid time window following a transmission from the remote unit. The base stations cannot initiate communication to the remote units, but instead send data to the remote units only as part of the exchange.

U.S. Patent No. 5,155,346 to Doing, et al. discloses a portable bar code scanner which includes a housing member having a pair of sloping supporting surfaces oriented at an angle to each other and a floor portion on which is mounted a reflecting mirror. One of the sloping supporting surfaces includes a transparent substrate. A source of scanning light beams such as a hand-held scanner is mounted adjacent the other sloping supporting surface for projecting a plurality of scanning light beams in the form of a scanning pattern at the reflecting mirror which reflects the scan pattern onto the transparent substrate over which a bar code label is passed enabling the scanning light beams to scan the bar label. A number of embodiments are disclosed for mounting the hand-held scanner adjacent the other sloping supporting surfaces and include an embodiment of the housing member rotatably mounted for movement to a number of rotated positions.

U.S. Patent No. 5,153,417 to Sakai et al. discloses a bar code reader which includes a hologram receiving a scanning light beam in sequence from a scanning light beam source for directing the scanning light beam to a bar code to be read along one path so that the bar code is scanned with the scanning laser beam in two-dimensional directions, and for guiding the scanning light beam to a photo-detector along the same path after the scanning light beam is reflected from the bar code, a condenser lens disposed in an optical system between the photo-detector and the hologram for collecting the reflected scanning light beam into the photo-detector, and a light blocking member disposed in an optical system between the condenser lens and the hologram for blocking unwanted light from the photo-detector, which unwanted light advances toward an incident side of the hologram on which the scanning light beam is directed.

U.S. Patent No. 5,149,950 to Swartz et al. discloses a portable laser diode scanning head, aimable at each symbol to be read, which emits and receives non-readily-visible laser light, and is equipped with a trigger-actuated aiming light arrangement for visually locating and tracking each symbol. A compact laser diode optical train and an optical folded path assembly, as well as an interchangeable component design and an integral window construction for the head also are disclosed.

U.S. Patent No. 5,142,550 to Tymes discloses a packet data transmission system used to link a number of remote hand-held data-gathering units such as bar code readers to a central computer which maintains a database management system. Data packets are sent from the remote units by an RF link to intermediate base stations, then sent by the base stations to the central computer by a serial link. Direct sequence spread spectrum modulation is used for the RF link.

The remote hand-held units initiate an exchange using RF transmission to and from the base stations, receiving only during a rigid time window following a transmission from the remote unit. The base stations cannot initiate communication to the remote units, but instead send data to the remote units only as part of the exchange.

U.S. Patent No. 5,132,523 to Bassett discloses a dual-mode laser scanning system, in which a portable manually trigger-actuated hand-held laser scanner embodies a magnetic flux sensor (i.e., Hall sensor) in order to detect that the hand-held scanner is placed in a matching stand. Upon detecting such arrangement, the Hall sensor produces a control signal which enables microprocessor to energize the scanning motor and laser diode, for hands-free operation of the scanner. When the scanner is to be operated in its normal hand-held operation, the user removes the scanner from its stand housing, whereby magnetic flux sensor generates a control signal which enables the microprocessor to control the scanner in its normal hand-held operation.

U.S. Patent 5,107,100 to Shepard et al. discloses in Fig. 6 a hand-held laser bar code scanner (head) supported from a goose-neck type stand.

U.S. Patent No. 5,086,215 to Carsner et al. discloses a bar code discrimination apparatus (10) which, as indicated at line 9-44 in col. 4, is used in conjunction with a conventional slot-type stationary bar code scanner and optical mark reader. Bar code discrimination apparatus requires the use of a laser scanning unit to generate a zig-zag laser scan line pattern across a scanner form, in order to determine whether a bar code symbol is present for subsequent scanning by slot-type code scanner. As indicated at lines 64-68 in Col. 5 and at lines 1-11 in Col. 6, when a bar code is present, an enable signal is sent to conventional decoder to signal the actual scanning and decoding of the bar code symbol. If a bar code is not discriminated on the scannable form, then a picking signal is sent to the optical marking reader, indicating that it should pick the scannable form from the input hopper and instead begin scanning the optical mark on the scannable form.

U.S. Patent No. 5,080,456 to Katz et al. discloses a bar code scanner employing a laser source and scan mirror for generating a light beam for scanning a bar code symbol or the like. The working range for distance between the scanner and the symbol is extended by placing an optical element in the path between the laser source and the scan mirror. This optical element may be a figure of rotation such as an axicon. A slit may be positioned downstream of the axicon to block the characteristic concentric rings produced in the beam in areas perpendicular to the scan line.

U.S. Patent No. 5,075,538 to Swartz et al. discloses a hand-held laser scanner having a printed circuit board upon which a single rotatable mirror structure is mounted. As disclosed, this rotary mirror structure carries both a scanning mirror and a concave collecting mirror, which undergo joint oscillatory motion in order to scan a laser beam through scanning window, while collecting and focusing reflected laser light towards a photosensor.

U.S. Patent No. 5,065,003 to Wakatsuki et al. discloses a casing of a portable data input/transmission apparatus which has an end portion, the size of which is determined such that the end portion can be held by one hand. A pen-scanner type bar code reader for reading a bar code is attached to one end of the casing in the longitudinal direction. A keyboard for enabling at least numerical data to be input is attached near the other end of the casing in the longitudinal direction. A transmitter/receiver is stored within the casing, the transmitter/receiver being

designed to output wirelessly to an external data processing apparatus code data read by the bar code reader and at least numerical data input from the keyboard. A pair of antenna-containing grooves are formed in a pair of facing side surfaces extending in the longitudinal direction of the casing, such that the grooves extend in the longitudinal direction of the casing to said other end of the casing. An antenna is provided such that it is freely inserted into and drawn from the antenna-containing grooves from the other end of the casing, the antenna being formed of a substantially U-shaped, electrically conductive elastic material and being fitted in the grooves by virtue of the elastic force of the antenna.

U.S. Patent 5,059,777 to Wittensoldner et al. discloses an in-counter type bar code scanner (20), in which changes in ambient light level at the scan window are detected by a detector, an amplifier and a threshold comparator, so as to provide an operator activity signal (IGE) to a microprocessor, whereupon a laser and a spinner motor driver are activated for 16 minutes.

U.S. Patent No. 5,047,617 to Shepard et al. discloses a narrow-bodied single- and twin-windowed hand-held, laser scanning head for reading bar code symbols which includes at least one window mounted at the rear region of the head, and through which either the incident beam going to the symbol and/or the reflected beam returning from the symbol, passes unobstructedly and exteriorly of, and past, the front and intermediate body regions of the head. A field-replaceable laser tube arrangement, a laser tube and method of making the same, an arrangement for and method of controlling a scanning system, optical passive elements for increasing the depth of field, a trigger protective device, and a one-piece support bench and method of fabricating the same by mass-production techniques are also disclosed.

U.S. Patent No. 5,029,183 to Tymes discloses a packet data transmission system used to link a number of remote hand-held data-gathering units such as bar code readers to a central computer which maintains a database management system. Data packets are sent from the remote units by an RF link to intermediate base stations, then sent by the base stations to the central computer by a serial link. Direct sequence spread spectrum modulation is used for the RF link. The remote hand-held units initiate an exchange using RF transmission to and from the base stations, receiving only during a rigid time window following a transmission from the remote unit. The base stations cannot initiate communication to the remote units, but instead send data to the remote units only as part of the exchange.

U.S. Patent No. 5,021,641 to Swartz et al. discloses a portable laser diode scanning head, aimable at each symbol to be read, which emits and receives non-readily-visible laser light, and is equipped with a trigger-actuated aiming light arrangement for visually locating and tracking each symbol. A compact laser diode optical train and an optical folded path assembly, as well as an interchangeable component design and an integral window construction for the head also are disclosed.

U.S. Patent No. 5,019,698 to Eastman discloses bar code readers using laser diodes which conserve electrical power and limit output laser radiation to levels required by governmental regulation (1 milliwatt average power) by utilizing a laser diode having an output optical power vs. laser current characteristic which has a slope efficiency in the region where stimulated (laser) emission occurs. The laser is operated with current pulses having a duty cycle less than 100%, and preferably in the range from 50% to 20% in the stimulated emission region of its

characteristic, such that the average output laser power does not exceed the level required by government regulations (1mw) while the laser output during the pulses is greater than 1mw. Upon detection after reflection or scattering (return of light) from the bar code, the optical signal is photodetected to provide an electrical signal which is envelope detected and components of the signal at the repetition rate of the current pulses are removed, as by filtering. The filtered signal is digitized to provide a digital signal from which the bar code may be decoded.

U.S. Patent No. 5,017,765 to Shepart et al. (corresponding to U.S. Patent No. 4,758,717) discloses a manually-triggered hand-held bar code symbol reader.

U.S. Patent No. 5,015,833 to Shepard et al. discloses a manually-activated hand-held laser scanner.

U.S. Patent No. 4,970,379 to Danstrom discloses a wand-type bar code scanner supportable in the hand of its user.

U.S. Patent No. 4,962,980 to Knowles discloses a laser scanning engine (i.e. a module) which is activatable by a trigger signal produced from a data terminal.

U.S. Patent No. 4,958,894 to Knowles discloses a laser scanning engine for integration into a bar code symbol reading system.

U.S. Patent No. 4,935,610 to Wike, Jr. discloses a finger-actuated bar code symbol reader in which a laser scanner is strapped to the wrist of the operator and an actuation button is mounted on the index finger thereof.

U.S. Patent No. 4,933,538 to Heiman et al. discloses a bar code symbol scanning system having an automatic (triggerless) mode of operation, during which the laser beam is used to detect the presence of both objects and bar code symbols.

U.S. Patent No. 4,930,848 to Knowles discloses a hand-held laser scanner which includes a manually actuatable member to initiate the operation of the scanner.

U.S. Patent Des. No. 305,885 to Barkan et al. discloses a manually-triggered hand-held bar code scanner.

U.S. Patent No. 4,897,532 to Swartz et al. discloses a hand-held laser scanner having a printed circuit board upon which a single rotatable mirror structure is mounted. As disclosed, this rotary mirror structure carries both a scanning mirror and a concave collecting mirror, which undergo joint oscillatory motion in order to scan a laser beam through scanning window, while collecting and focusing reflected laser light towards a photosensor.

U.S. Patent No. 4,877,949 to Danielston et al. discloses a manually-activated CCD bar code reader which, as indicated at lines 17-18 in Col. 4 and lines 1-31 in Col. 10, requires manual activation of a switch to "wake-up" a microprocessor and permit operation of a reading distance sensor and a flashable illuminator.

U.S. Patent No. 4,845,349 to Cherry discloses a manually-triggered laser bar code scanner having laser emission control circuits.

U.S. Patent No. 4,835,374 to Swartz et al. discloses a portable laser diode scanning head, aimable at each symbol to be read, which emits and receives non-readily-visible laser light, and is equipped with a trigger-actuated aiming light arrangement for visually locating and tracking each symbol. A compact laser diode optical train and an optical folded path assembly, as well as an interchangeable component design and an integral window construction for the head also are disclosed.

U.S. Patent No. 4,825,057 to Swartz et al. discloses a manually-triggered hand-held laser bar code scanner.

U.S. Patent No. 4,816,660 to Swartz et al. discloses a manually-triggered hand-held laser bar code scanner.

U.S. Patent No. 4,806,742 to Swartz et al. discloses a portable laser diode scanning head, aimable at each symbol to be read, which emits and receives non-readily-visible laser light, and is equipped with a trigger-actuated aiming light arrangement for visually locating and tracking each symbol. A compact laser diode optical train and an optical folded path assembly, as well as an interchangeable component design and an integral window construction for the head also are disclosed.

U.S. Patent No. 4,766,299 to Tierney et al. discloses in Fig. 3, at Col. 3, lines 67-68 and at Col. 4, lines 1-7 a hand-mounted bar code symbol reading device which produces visible pointing beam 26 (as visible markers) for directing an infrared laser scanning beam to a bar code to be scanned.

U.S. Patent No. 4,766,297 to McMillan discloses a dual mode (i.e., portable or stationary) system for scanning bar code symbols. As disclosed, a hand-held scanner (12) is received within a stationary stand having an IR object detection system comprising an IR emitter, an IR detection and a trigger circuit contained in the head and base portions of the stand, respectively. In order to operate the scanner without activation of its manual trigger switch, the scanner output cord must be plugged into the connector input in the base of the stand. The system is wholly incapable of triggerless operation when removed from the stationary stand.

U.S. Patent No. 4,760,248 to Swartz, et al. discloses a hand-held laser scanner having a printed circuit board upon which a single rotatable mirror structure is mounted. As disclosed, this rotary mirror structure carries both a scanning mirror and a concave collecting mirror, which undergo joint oscillatory motion in order to scan a laser beam through a scanning window, while collecting and focusing reflected laser light towards a photosensor.

U.S. Patent No. 4,736,095 to Shepard et al. discloses a manually-triggered hand-held laser bar code scanner.

U.S. Patent No. 4,713,785 to Antonelli et al. discloses a system for preventing processing of duplicative coded label signals generated by a scanner lacking item detectors. The system

establishes a variable lockout time as a function of operator performance. Any detected label candidate which duplicates a candidate received within the lockout time is assumed to be duplicative. Any transfer to the terminal is inhibited. Operator performance is tracked by measuring the inter-item arrival times for candidates actually transferred to the terminal. The inter-item arrival times are averages over a given number of items. The average value is used to select a lockout time which is generally proportional to the average inter-item arrival time.

U.S. Patent No. 4,673,805 to Shepard et al. discloses a manually-triggered hand-held bar code laser scanner.

U.S. Patent No. 4,647,143 to Yamazaki et al. discloses a holographic laser scanner having a transparent glass reading window 40 with a slotted cover 41 disposed thereover, for "cutting off unnecessary light" from reaching photodetector 8 within the housing.

U.S. Patent No. 4,639,606 to Boles et al. discloses at Figs. 3-5 and lines 41-66, Col. 2, an automatic bar code symbol reader that rereads the same bar code symbol every 40 milli-seconds, provided that bar code symbol is decoded each time within 1 milli-second or less time period. (See State Transition Cycle E-F-E in Fig. 5).

U.S. Patent No. 4,621,189 to Kumar et al. discloses a hand-held data entry terminal having a keyboard, display, data storage memory, and an optical scanner head connected thereto for reading bar code symbols.

U.S. Patent No. 4,593,186 to Swartz et al. discloses an entirely field-portable laser scanning system for reading bar code symbols which includes a light-weight and small-sized laser scanning head. The laser source, power supply component, optics, scanning elements, sensor circuit, and signal processing circuitry are specially designed for minimal size and weight and volume such that they can all be mounted in the head. The head can be bracket-mounted or hand-held. The housing for the head can be provided with a handle grip, or can be gun-shaped. High-speed oscillating scanning motors and/or penta-bimorph scanners are used as scanning elements. A trigger initiates repetitive scanning of each object bearing a symbol, and an indicator indicates when the scanning of that particular object has been terminated. A body harness supports the remaining scanner system circuitry. A non-bulky, free-movable cable interconnects the head to the body harness. Methods of scanning the symbol and of operating the system are also disclosed.

U.S. Patent No. 4,575,625 to Knowles discloses a manually-triggered hand-held bar code laser scanner.

U.S. Patent No. 4,570,057 to Chadima, Jr., et al. discloses a hand-held diode-array (CCD) bar code reading device. As disclosed at lines 23-32 in Col. 7, the hand-held CCD device includes a trigger switch S1 (e.g. button or proximity detector) which, when closed, effectuates the discharge of flash energy storage capacitor assembly (30) into a Xenon gas filled flash tube (60). In response, flash tube (60) instantaneously illuminates the object with a flash tube (60) instantaneously illuminates the object with a flash of intense light energy, causing a reflected bar code image to be formed through optical system on a 1024 element CCD line scanner (A3). As disclosed at lines 35-39 in Col. 7, data from the CCD line scanner is provided to a microprocessor (A1) which calculates bar spacing and widths and derives the bar code number. As indicated at

line 7-18 in Col. 11, if the bar code number is not valid, the microprocessor retriggers Xenon flash tube (60) and repeats the reading process a number of times (e.g., twenty-times).

U.S. Patent No. 4,521,678 to Winter discloses a battery-powered bar code scanner, which has a control circuit that automatically turns itself off when the sensor is not used for a predetermined time period.

U.S. Patent No. 4,496,831 to Swartz et al. discloses a manually-triggered hand-held laser bar code scanner.

U.S. Patent No. 4,465,926 to Apitz et al. discloses a hand-held bar-code reader (bar-code wand) which forms part of an optical reading device and is capable of being led by hand over the bar code, which comprises a storage circuit for storing the data pulse train corresponding to the scanning signals, and a photo- or sound-transmitter by which the stored data pulse train is transmitted to a separate equipment, such as a video tape recorder or radio receiver provided with a photo- or sound-receiver and an evaluating circuit. In another example of embodiment, the equipment comprising the evaluating circuit, contains a reader compartment provided with a connector member for connection to the reader which, following the scanning and storing of one or more words of the character code, is returned to its compartment and is automatically read out via the connector contacts.

U.S. Patent No. 4,460,120 to Shepard et. al. discloses a manually-triggered hand-held bar code symbol reader.

U.S. Patent No. 4,431,912 to Dickson et al. discloses an encounter optical scanner, in which a light source and detector (16) are provided above the counter (10) in order to generate scan control signals for provision to processor (36).

U.S. Patent No. 4,409,470 to Shepard et al. discloses a manually-triggered hand-held laser bar code scanner.

U.S. Patent No. 4,387,297 to Swartz et al. discloses a manually-triggered bar code reading device.

U.S. Patent No. 4,282,425 to Chadima, Jr. et al. discloses a portable bar code symbol reader having a flash-type illuminator and proximity sensor similar to the system disclosed in the U.S. Patent No. 4,570,057.

U.S. Patent No. 4,279,021 to See et al. discloses a reprogrammable hand-held data entry device having a data entry keyboard display, a battery power pack, data storage memory and a serial data communication port for connection of peripheral data entry device.

U.S. Patent No. 4,240,064 to DevChoudhury discloses a power control circuit for a bar code reading system which supplies power to the system only when the bar code is being read.

U.S. Patent No. 4,086,476 to King discloses a counter-type optical reader having a control system which utilizes a photo-diode (42) and light source (46) to generate a signal upon the

interruption of the light beam from the light source by an object.

U.S. Patent No. 4,072,859 to McWaters discloses a portable optical character recognition system having an object detection circuit which uses infra-red light.

European Publication No. 0 871 138 A2 by Metrologic Instruments, Inc. discloses a method and apparatus for automatically reading bar code symbols. One aspect of the present invention concerns a method of reading bar code symbols using an automatic hand-holdable bar code symbol reading device. In general, the automatic bar code symbol reading device comprises a hand-holdable housing containing operative elements which provide an object detection field and a scan field each defined external to the housing. The method involves automatically detecting the presence of an object within the object detection field by sensing energy reflected off the object. In a preferred embodiment, the energy reflected off the object is IR radiation produced from an object sensing energy source disposed within the housing. In automatic response to the detection of the object within the object detection field, the hand-holdable device detects the presence of a bar code aligned by the user within the scan field using a laser beam produced within the housing. Then, in automatic response to the detection of a bar code in the scan field, the automatic hand-holdable bar code symbol reading device reads the detected bar code in the scan field by producing scan data signals from the detected bar code and thereafter collecting and analyzing the same. Another aspect of the present invention concerns a hand-holdable data collection device adapted for use with the automatic bar code symbol reading device to form a portable symbol reading system which is versatile and simple to use.

European Publication No. 0 460 669 A2 by Sumitomo Electric Industries, Ltd. discloses a laser scanner which employs a light-based object detector that automatically senses the presence of an object by sensing light reflected off the object, and in response thereto, automatically produces a laser scanning beam for reading bar code symbols that might be located on the detected object.

European Publication No. 0 424 976 A2 by Canon Kabushiki Kaisha discloses a data reading apparatus which has a data reading device, which is set in a data read state upon operation of an operation switch, provided with a first timer for measuring a time in which the operation switch is not operated, and a second timer for measuring a time in which no data input is detected while the operation switch is operated, wherein the data reading state is canceled according to an output from the first or second timer.

European Publication No. 0 424 097 A1 by Fujitsu Limited discloses an article detection device which includes: a light emission unit for emitting a detection light for irradiation onto an article; a light reception unit for receiving a light reflected from the article; an analog-to-digital converter for converting the reflected light to a digital signal; a first register for storing the digital signal after being sampled using a first sampling signal having a first period; a second register for storing the digital signal after being sampled using a second sampling signal having a second period shorter than the first period; and a control unit for generating the first and second sampling signals to be sent to the first and second registers, reading the digital signal stored in the first and second registers, calculating a difference between the digital signals in the first register and second register, comparing an absolute value of the difference with a predetermined threshold value, and detecting the article when the absolute value is larger than the threshold value.

European Publication No. 0 414 452 A1 by NCR Corporation discloses a portable hand-held optical scanner comprising a disk-shaped housing which fits within the palm of the hand of a checkout operator, which scanner includes a scanning mechanism for generating a scanning pattern for scanning coded indicia, a strap member for securing the hand of the operator to the housing, a switch mounted on the rear surface of the housing adjacent the fingers of the operator for easy operation by the operator, a data processor and a transmitter for transmitting the data read by the scanner to a remote pickup.

European Publication No. 0 323 848 A3 by Tokyo Electric Co., Ltd. discloses a bar code reader having a laser scanner for scanning bar code symbols and an object detector for detecting an object bearing the bar code symbols.

The Symbol Technologies' Technology and White Paper entitled "Pocket-Sized Computing For the Mobile Industry Professionals" (3 pages) discloses a hand-held palm-type computing device (i.e. Symbol's SPT 1500) in which a laser scanning bar code symbol scanner is integrated. The laser scanner is activated by a manually-actuatable switch disposed on the hand-supportable housing of the device.

The Symbol Technologies' Press Release entitled "Symbol Adds Functionality to PalmPilot" (2 pages) discloses a hand-held palm-type computing device (i.e. Symbol's SPT 1500) in which a laser scanning bar code symbol scanner is integrated. The laser scanner is activated by a manually-actuatable switch disposed on the hand-supportable housing of the device.

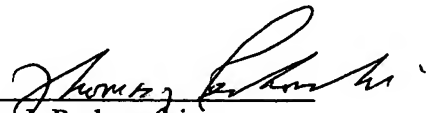
The product brochure for Metrologic's MH290 Hand Held Laser Scanner describes a lightweight handheld bar code laser scanner with a large depth of field.

The 1984 IBM Technical Bulletin entitled "Hand-Held Holographic Scanner Having Highly Visible Locator Beam" describes a hand-held bar code scanner that uses a semiconductor laser as the source of the infrared scan beam, and a second incandescent light source to provide guidance to the operator in scanning operations. The light produced by this incandescent light source would be filtered by a blue or green filter to provide a highly visible output beam.

A separate listing of the above references on PTO Form 1449 and a hard copy of foreign and technical references are enclosed herewith for the convenience of the Examiner. Copies of U.S. references in .pdf format are submitted herewith in on a compact disc.

Respectfully submitted,

Dated: February 25, 2004

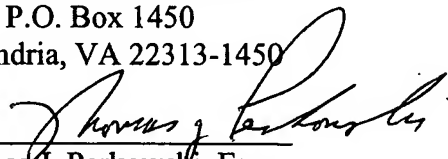


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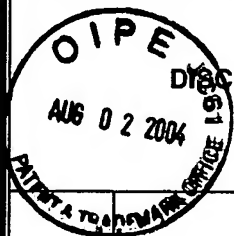
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Thomas J. Perkowski, Esq.
Dated: February 25, 2004

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**INFORMATION
DISCLOSURE STATEMENT
BY APPLICANT**

Sheet

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of

12

Complete If Known

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|------------------------|---------------------|
| Application Number | 10/613,527 |
| Filing Date | July 3, 2003 |
| First Name Inventor | Mark Schmidt et al. |
| Group Art Unit | 2876 |
| Examiner Name | n/a |
| Attorney Docket Number | 108-194USANE0 |

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